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ABSTRACT

Anthropometric data and apparel sizing is an important component of apparel quality. Apparel can not be top quality unless it fits the potential wearers satisfactorily. In the United States, current sizing standards rely on body measurement data that were gathered by the U.S. Department of Agriculture during the late 1930's. Apparel must fit today's population. Except for the study by the American Society for Testing and Materials to improve sizing for women over age 55, there has been no comprehensive anthropometric study of today's diverse population undertaken in the United States. Related issues such as definitions of body dimensions, body type classifications, measurement techniques, target population groups, and database management methods for the collection of body measurements all are important topics for apparel researchers.

This report represents a compilation of body dimensions that are used in the manufacturing and fitting of apparel. It is the result of a comparison of five body measurements reports, including documentations of national and international apparel sizing standards. The information in this report will provide the basis for the development of the information model of made-to-measure pattern making. It will also contribute to the conducting of future body measurements surveys and the development of new or improved sizing standards for apparel.

KEY WORDS

anthropometry; apparel; APDES; body dimensions; body measurements; fit; patterns; sizing

INTRODUCTION

The apparel industry has used computer systems to automate many of its manufacturing processes. However, the manufacturing innovations often stand alone as "islands of automation." Integrating the separate automated processes could greatly improve the effectiveness of the entire enterprise. In recent years, the National Institute of Standards and Technology (NIST), under the sponsorship of the Defense Logistics Agency (DLA), has been developing the apparel product data exchange standard (APDES) [LEE1]. The goal of the APDES project is to develop a comprehensive specification for sharing apparel product data among all stages of the product life cycle. We, the APDES project members at NIST, have determined a set of manufacturing data interfaces that could be standardized for the effective integration of the information systems required to operate an apparel manufacturing enterprise [MONC]. We have also developed an information model for ready-to-wear pattern making, which is one of the manufacturing data interfaces being identified [LEE2].

We are currently developing an information model of made-to-measure pattern making and have conducted a literature survey on made-to-measure technology. As a result of the survey, a bibliography on apparel sizing and related issues has been generated for the quick use of apparel researchers [LEE3]. We are now working on a task to determine and organize the body dimensions necessary for manufacturing and fitting garments. The organized body dimensions can then be modelled and exchanged in an efficient manner with the apparel enterprise processes that need them.

One of the critical problems that impact the future development of made-to-measure quality garments is the need for reliable and accurate anthropometric data. Many designers, manufacturers, retailers, and customers are also concerned that the current apparel sizing standards do not describe the body configurations of today's population. The apparel industry needs consistent and accurate apparel sizing standards that reflect body measurements of today's population in order to increase the quality of ready-to-wear garments.

The purpose of this report is to present body dimensions that are needed for the fit and manufacture of garments and patterns. The body dimensions will provide the basis for the development of the information model of made-to-measure pattern making. It also provides a suggested list of data requirements for the collection of body measurements. The next section, *Methodology*, describes the process of compiling body dimensions. The *Entries of Body Dimensions Table* section lists types of information included in the Body Dimensions Table. The Table itself is shown in Appendix B. Appendix A is a compilation of principal body landmarks that are used in the definitions of Body Dimensions Table. The Summary section contains concluding remarks.

METHODOLOGY

There exists a wealth of anthropometric data collection, such as Anthropometry of Women of U. S. Army [CHUR], Anthropometry of Air Force Women [CLAU], the National Aeronautics and Space Administration's Anthropometry for Designers [MCCO], the Department of Agriculture's

Body Measurements for Garment and Pattern Construction [OBRI], etc. These anthropometric data were taken from different sources which used different body dimensions, body measurement methods, body referencing systems on different target population for different applications. For example, the Anthropometry for Designer was tailored to meet the needs of engineers engaged in the design of equipment, habitability areas, workspace layouts, life-support hardware, and clothing for the NASA (National Aeronautics and Space Administration) Space Shuttle/Spacelab program, and all anthropometric data were collected in the weightless environment. However, the Anthropometry of Women of the U. S. Army was generated during the winter of 1976-1977 to satisfy the need by the U. S. Army for up-to-date data on the body sizes and strength capabilities of Army women.

This article is aimed at the study of body measurements for apparel and pattern making only. Thus, five reports, [NBS], [NBS-m], [ISO], [ASTM], and [MD] (refer to the *References* section), were selected as references for this study from the bibliography that was generated previously [LEE3]. The approach of the study for this report is to compile body dimensions that will provide a complete coverage of those in the above five references. Definitions of all body dimensions in the references have been examined and compared. The comparison result is then summarized in a table that lists a set of body dimensions needed in the manufacturing and fitting of apparel. Body dimensions presented in different references with a common definition are grouped as one body dimension. A brief summary of each reference is described as follows.

[NBS] is a report on *Body Measurements for the Sizing of Women's Patterns and Apparel*. It is a voluntary product standard developed by the National Bureau of Standards (NBS). The standard covers standard size classifications, size designations, and body measurements to aid in the consistency of sizing of women's apparel. It also covers applications of the sizing system, definitions and methods of measurement, and recommended methods for identifying products that are sized in accordance with this standard.

[NBS-m] is a report on *Body Measurements for the Sizing of Apparel for Men (Student)*. It is another NBS voluntary apparel sizing standard that covers same information as in the [NBS], but is aimed at young men or students.

[ISO] is a report on *Garment Construction and Anthropometric Surveys - Body Dimensions*. It is an international standard developed by the International Organization for Standardization. The standard defines the location of body dimensions for anthropometric surveys and for the preparation of garment patterns as well as garment stands. It also specifies a standard procedure for measuring the body.

[ASTM] is a report on *Development of Body Measurement Tables for Women 55 and Older and the Relationship to Ready-to-Wear Garment Size*. It provides the first set of specific body measurements of women 55 years and older. The study was performed by the ASTM (American Society for Testing and Materials) Institute for Standards Research. The report also identifies key body dimensions that are related to garment fitting problems for women aged 55 and over.

[MD] is a report on *Measurement Specification Document*. It provides information of mens'

and womens' measurement specifications for two types of applications: interface by human user and interface by computer. The work was performed by the Microdynamics Inc. for supporting the Textile/Clothing Technology Corporation's made-to-measure technology research project. [MD] includes two separate documents: women's edition and mens' edition. Sixty-six dimensions are defined in the women's edition, while fifty-nine dimensions are in the men's edition. There are fifty-eight dimensions in common between men's and women's. Thus, the women's edition is used as the primary reference in this report.

ENTRIES OF BODY DIMENSIONS TABLE

Two appendices, Appendix A and Appendix B, are included in this report. Appendix A is a glossary of body landmarks used in the definitions of body dimensions. The *Standard Terminology Relating to Body Dimensions for Apparel Sizing* section in the "1992 Annual Book of ASTM Standards" was the main reference for developing this glossary [ASTM-d]. Appendix B presents a table containing all dimensions of the human body that are used in making patterns and garments based on the five reports mentioned above. All measurements are made with the subject standing upright unless otherwise specified. A total of ninety-one dimensions (items) are included in the table. Each dimension in the table is composed of five fields: numeric identification, dimension name, definition, category, and the references which include the dimension. The following provides a brief description of each field.

"Identification" defines an identification number for the body dimension.

"Name" gives a name for the body dimension. Each name is specified by a string of characters.

"Definition" provides a description of body locations and process for taking body measurement. Definitions are summarized from the five referenced reports.

"Category" gives a category for the body dimension. Five categories (girth, vertical, length, angle, and weight) are included in the table. "Girth" is a horizontal and circular measurement of the body. "Vertical" is a measure of the vertical distance for the required section of the body. "Length" is a measure of the distance between two or more measurement points. "Angle" is an angle of inclination measurement. "Weight" is a measure of the heaviness of the subject.

"References" lists a set of references by abbreviation which include the dimension and the location of the definition (by paragraph number) in each reference.

SUMMARY

This report presents a preliminary set of body dimensions that are necessary in the manufacturing and fitting of apparel. The information of these body dimensions will be the basis for the development of the information model of made-to-measure pattern making. Requirements of body

measurements for different groups of people are somewhat varied. (Groups of people may depend on ages, genders, ethnic origin, etc.) Further study may be necessary to determine body dimensions requirements for the specific groups. For completeness, additions and modifications to the preliminary set of body dimensions will be needed. The author expects that the information in this report will contribute to future body measurements surveys as well as the development of new or improved sizing standards.

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[NBS-m] National Bureau of Standards, "Body Measurements for the Sizing of Apparel for Men (Student)," NBS Voluntary Product Standard PS 45-71, United States Department of Commerce/National Bureau of Standards, Gaithersburg, MD, 1972.

[OBRI] Department of Agriculture, "Women's Measurements for Garment and Pattern Construction," Miscellaneous Publication No. 454, Government Printing Office, Washington D.C., 1941.

Body Landmark **Definition**

Abdomen	The part of body between the thorax and pelvis that encloses the viscera.
Ankle	The joint between the foot and the lower leg.
Armpit	The level of the hollow part under the arm at the shoulder.
Bust	The part of woman's body between the neck and the abdomen.
Calf	The part of leg between the knee and ankle.
Cervical	The prominence on the seventh or lowest cervical vertebra at the back of the neck.
Chest	The part of the body between the neck and the abdomen, enclosed by the ribs and the breastbone.
Crotch	The body area adjacent to the vertex of the included angle between the legs, or the level of the base of the buttocks.
Crown	The top of the head.
Elbow	The joint which articulates between the upper arm and the lower arm.
Forearm	The part of the arm extending from the wrist to the elbow.
High Hip	The level of the fullest part of the abdomen that is located approximately 7.5 centimeters or 3 inches below the waist and parallel to the floor.
Hip	The outer bony prominence of the upper end of the thigh bone.
Knee	The joint between the lower and upper leg.
Neck	The part of the body linking the head and trunk.

<u>Body Landmark</u>	<u>Definition</u>
Shoulder	The joint that connects the arm with the trunk.
Shoulder Point	The juncture of the collarbone and the shoulder blade.
Waist	The part of the body at the location between the lowest rib and hip identified by bending the body to the side.
Wrist	The joint which articulates between the end of the lower arm and the hand.

APPENDIX B: Table of Body Dimensions

<u>ID</u>	<u>Name</u>	<u>Definition</u>	<u>Category</u>	<u>References</u>
1.	Bust-girth	The maximum horizontal girth at bust level measured under the armpits and across the nipples with the subject breathing normally. (women)	girth	NBS 5.2.a ISO 2.1.8 ASTM B.4 MD 1.6
2.	Chest-girth	The maximum horizontal girth at chest level measured under the armpits and across the nipples with the subject breathing normally. (men)	girth	ISO 2.1.7 NBS-m 6.3.1 MD 1.5
3.	Waist-girth	The girth measured at waist level with the subject breathing normally and the abdomen relaxed.	girth	NBS 5.2.b ISO 2.1.11 ASTM B.6 NBS-m 6.3.2 MD 1.7
4.	Hip-girth	The maximum horizontal girth measured at the hip level.	girth	NBS 5.2.c ISO 2.1.12 ASTM B.8 NBS-m 6.3.3 MD 1.8
5.	Neck-girth	The girth of the neck measured below the Adam's apple and at the level of the 7th cervical vertebra.	girth	NBS 5.2.e ISO 2.1.2 ASTM B.1 MD 1.1

<u>ID</u>	<u>Name</u>	<u>Definition</u>	<u>Category</u>	<u>References</u>
6.	NeckBase-girth	The girth of the base of the neck measured around the neck passing over the base of the 7th cervical vertebra, the intersection points of shoulder and neck, and the upper borders of the collar bone at the front.	girth	NBS 5.2.d ISO 2.1.3 ASTM B.2 NBS-m 6.3.9
7.	Armscopye-girth	The girth of the armscopye measured through the underarm midpoint and vertically over the shoulder with subject's arms hanging naturally.	girth	NBS 5.2.f ISO 2.2.20 ASTM B.14 NBS-m 6.3.10
7.1	Armscopye-girth-right			MD 1.2
7.2	Armscopye-girth-left			MD 1.3
8.	UpperArm-girth	The maximum girth of the upper arm at lowest scye level measured with subject's arms hanging naturally.	girth	NBS 5.2.n ISO 2.1.13 ASTM B.15 NBS-m 6.3.11
8.1	UpperArm-girth-right			MD 1.11
8.2	UpperArm-girth-left			MD 1.12

<u>ID</u>	<u>Name</u>	<u>Definition</u>	<u>Category</u>	<u>References</u>
9.	Elbow-girth	The girth of the elbow measured with subject's arm bent at right angle and the hand and fingers facing forward.	girth	NBS 5.2.o ISO 2.1.14 ASTM B.16 NBS-m 6.3.12 MD 1.13
9.1	Elbow-girth-right			MD 1.14
9.2	Elbow-girth-left			
10.	Wrist-girth	The girth of the wrist measured around the arm over the wrist bone with subject's arms hanging naturally.	girth	NBS 5.2.p ISO 2.1.15 ASTM B.17
10.1	Wrist-girth-right			MD 1.17
10.2	Wrist-girth-left			MD 1.18
11.	Knee-girth	The horizontal girth of the knee measured around the leg over the knee cap.	girth	NBS 5.2.k ISO 2.1.20 ASTM B.11 NBS-m 6.3.7
11.1	Knee-girth-right			MD 1.23
11.2	Knee-girth-left			MD 1.24

<u>ID</u>	<u>Name</u>	<u>Definition</u>	<u>Category</u>	<u>References</u>
12.	Calf-girth	The maximum girth of the calf measured between the knee and ankle and around the leg.	girth	NBS 5.2.1 ISO 2.1.22 ASTM B.12 NBS-m 6.3.8
12.1	Calf-girth-right			MD 1.25
12.2	Calf-girth-left			MD 1.26
13.	Ankle-girth	The girth of the ankle measured around the leg at the level of the center of the ankle bone.	girth	NBS 5.2.m ISO 2.1.24 ASTM B.13
13.1	Ankle-girth-right			MD 1.29
13.2	Ankle-girth-left			MD 1.30
14.	Thigh-girth	The horizontal girth of the thigh measured around the upper part of the leg and at the highest thigh position.	girth	NBS 5.2.i ISO 2.1.18 ASTM B.9 NBS-m 6.3.6
14.1	Thigh-girth-right			MD 1.19
14.2	Thigh-girth-left			MD 1.20

<u>ID</u>	<u>Name</u>	<u>Definition</u>	<u>Category</u>	<u>References</u>
15.	MidThigh-girth	The horizontal girth of the thigh measured around the leg midway between the hip level and the knee.	girth	NBS 5.2.j ISO 2.1.19 ASTM B.10
15.1	MidThigh-girth-right			MD 1.21
15.2	MidThigh-girth-left			MD 1.22
16.	HighHip-girth	The horizontal girth of the high hip measured at the level of the high hip with the subject's abdomen relaxed.	girth	NBS 5.2.g ASTM B.7 MD 1.10
17.	VerticalTrunk-girth	The girth of trunk measured from the right shoulder line midway between the neck base and the shoulder point, down the back through the crotch and over the projection of the right breast to the starting point.	girth	NBS 5.2.q ISO 2.2.18 ASTM B.24 NBS-m 6.3.4
18.	UnderBust-girth	The horizontal girth of the body just below the breasts. (women)	girth	ISO 2.1.10 ASTM B.5
19.	Hand-girth	The maximum girth of the hand measured over the knuckles of the open right hand with subject's fingers together and the thumb excluded.	girth	ISO 2.1.16

<u>ID</u>	<u>Name</u>	<u>Definition</u>	<u>Category</u>	<u>References</u>
20.	Head-girth	The maximum horizontal girth of the head measured above the ears.	girth	ISO 2.1.1
21.	LowKnee-girth	The horizontal girth of the lower knee measured at the level just below the right knee cap.	girth	ISO 2.1.21
22.	LowerLeg-girth	The minimum horizontal girth of the lower leg measured at the level just above the ankle.	girth	ISO 2.1.23
22.1	LowerLeg-girth-right			MD 1.27
22.2	LowerLeg-girth-left			MD 1.28
23.	Thigh-seated-girth	The girth of the upper thigh measured at the highest thigh position with the subject sitting.	girth	NBS 5.2.h
24.	HighBust-girth	The bust girth measured, not parallel to the floor, across the chest above the bust and across the back close to the underarm.	girth	ASTM B.3
25.	Hip-seated-girth	The girth of the hip measured at the fullest part of hip with the subject sitting.	girth	ASTM B.54

<u>ID</u>	<u>Name</u>	<u>Definition</u>	<u>Category</u>	<u>References</u>
26.	Forearm-girth	The maximum horizontal girth of the forearm measured around the forearm with subject's arms hanging naturally.	girth	
26.1	Forearm-girth-right			MD 1.15
26.2	Forearm-girth-left			MD 1.16
27.	MaxAbdomen-girth	The maximum horizontal girth of the abdomen measured below the lower chest and above the high hip.	girth	MD 1.9
28.	Shoulder-girth	The maximum horizontal girth of shoulder measured below the neck and above the underarm.	girth	MD 1.4
29.	Height	The vertical distance measured from the crown to the soles of feet with the subject standing upright and the feet together without wearing shoes, or with the subject (infants) lying on table.	vertical	NBS 5.4.a ISO 2.1.26 ISO 2.2.1 ASTM B.57 NBS-m 6.2.1
30.	Hip-height	The vertical distance measured from the midpoint of the crotch to soles of feet.	vertical	NBS 5.4.e ISO 2.2.4 ASTM B.31

<u>ID</u>	<u>Name</u>	<u>Definition</u>	<u>Category</u>	<u>References</u>
31.	Knee-height	The vertical distance measured from the knee to the soles of feet.	vertical	NBS 5.4.g ISO 2.2.6 ASTM B.33 NBS-m 6.2.5
32.	Waist-height	The vertical distance measured from the waist to soles of feet.	vertical	NBS 5.4.c ISO 2.2.3 ASTM B.26 NBS-m 6.2.3
33.	Armseye-depth	The vertical distance measured from the 7th cervical vertebra to the armpits level.	vertical	NBS 5.5.e ISO 2.2.9 ASTM B.43 NBS-m 6.4.4
34.	Ankle-height	The vertical distance measured from the ankle to the soles of feet.	vertical	NBS 5.4.h ISO 2.2.7 ASTM B.34
35.	Cervical-height	The vertical distance measured from the 7th cervical vertebra to the soles of feet.	vertical	NBS 5.4.b ASTM B.27 NBS-m 6.2.2
36.	Crotch-height	The vertical distance measured from the midway point of the crotch to the soles of feet.	vertical	NBS 5.4.f ASTM B.32 NBS-m 6.2.4

<u>ID</u>	<u>Name</u>	<u>Definition</u>	<u>Category</u>	<u>References</u>
37.	HighHip-height	The vertical distance measured from the high hip level to the soles of feet.	vertical	NBS 5.4.d ASTM B.30
38.	Trunk-length	The vertical distance measured from the 7th cervical vertebra to the crotch level.	vertical	ISO 2.2.2
39.	InsideLeg-length	The vertical distance measured from the crotch to the ground with subject's feet slightly apart.	vertical	ISO 2.2.27
40.	Cervical-seated-height	The vertical distance measured from the 7th cervical vertebra to the top of the table with the subject sitting erect on the table.	vertical	ISO 2.2.8
41.	Thigh-length	The vertical distance measured on the inside leg from the crotch level to the knee level.	vertical	ISO 2.2.26
42.	Waist-to-crotch	The vertical distance measured from the waist level to the crotch level.	vertical	ISO 2.2.5
43.	Waist-to-highHip	The vertical distance measured on the right side of the body from the waist level to the high hip level.	vertical	ASTM B.28

<u>ID</u>	<u>Name</u>	<u>Definition</u>	<u>Category</u>	<u>References</u>
44.	Bust-to-waist	The vertical distance measured from the bust point to the waist level.	vertical	
44.1	Bust-to-waist-right			MD 2.3
44.2	Bust-to-waist-left			MD 2.5
45.	BackNeck-to-waist	The vertical distance measured from the intersection of the shoulder and the neck to the waist level.	vertical	
45.1	BackNeck-to-waist-right			MD 2.32
45.2	BackNeck-to-waist-left			MD 2.33
46.	Underarm-length	The distance measured from the mid-point of the armpit to the far end of the prominent wrist bone, with subject's arms hanging naturally.	length	NBS 5.5.1 ISO 2.2.24 ASTM B.48
46.1	Underarm-length-right			MD 2.19
46.2	Underarm-length-left			MD 2.20
47.	Waist-to-hip	The length measured along the side of the body from the waist level to the hips at the level of greatest lateral trochanteric projection following the hip contour.	length	NBS 5.5.g ISO 2.2.17 ASTM B.29 NBS-m 6.4.7

<u>ID</u>	<u>Name</u>	<u>Definition</u>	<u>Category</u>	<u>References</u>
48.	NeckShoulder-to-bust	The length measured from the intersection of shoulder and neck to the bust point.	length	NBS 5.5.d ISO 2.2.15 ASTM B.37
48.1	NeckShoulder-to-bust-right			MD 2.6
48.2	NeckShoulder-to-bust-left			MD 2.7
49.	UpperArm-length	The distance measured from the shoulder point, along the outside of the arm, to the elbow, with the subject's right fist clenched and placed on the hip, and with the arm bent at right angle.	length	NBS 5.5.k ISO 2.2.21 ASTM B.46
49.1	UpperArm-length-right			MD 2.13
49.2	UpperArm-length-left			MD 2.14
50.	Shoulder-length	The distance measured from the intersection of shoulder and neck, along the shoulder, to the shoulder point, with subject's arms hanging naturally.	length	NBS 5.5.h ISO 2.1.4 ASTM B.45 NBS-m 6.4.1
50.1	Shoulder-length-right			MD 2.35
50.2	Shoulder-length-left			MD 2.36

<u>ID</u>	<u>Name</u>	<u>Definition</u>	<u>Category</u>	<u>References</u>
51.	Arm-length	The distance measured from the right shoulder point, along the outside of the arm, over the elbow, to the far end of the prominent wrist bone, with the subject's right fist clenched and placed on the hip, and with the arm bent at right angle.	length	NBS 5.5.j ISO 2.2.22 ASTM B.47
52.	CrossBack-width	The horizontal distance measured across the back of the body from armscye to armscye approximately at the level midway between the upper armscye and lower armscye.	length	NBS 5.5.a ISO 2.1.6 ASTM B.40 NBS-m 6.4.2 MD 2.27
53.	Crotch-length	The distance measured from the center point of the front body at the waist level, through the crotch, to the center point of the back body at the waist level.	length	NBS 5.5.m ISO 2.2.19 ASTM B.49 NBS-m 6.3.5
54.	BackWaist-length	The distance measured from the 7th cervical vertebra, along the rear contour of the spinal column, to the waist level.	length	NBS 5.5.p ISO 2.2.10 ASTM B.25 NBS-m 6.4.5 MD 2.26
55.	Bust-width	The horizontal distance measured between the bust points (nipples).	length	NBS 5.5.c ISO 2.1.9 ASTM B.36 MD 2.8

<u>ID</u>	<u>Name</u>	<u>Definition</u>	<u>Category</u>	<u>References</u>
56.	NeckBase-to-waist	The distance measured from the center front of the neck base line to the center front at the waist level.	length	NBS 5.5.o ASTM B.39 NBS-m 6.4.6 MD 2.1
57.	CrossChest-width	The horizontal distance measured across the front of the body from armseye to armseye approximately at the level midway between the upper armseye and the lower armseye.	length	NBS 5.5.b ASTM B.35 NBS-m 6.4.3
58.	Armseye-to-waist	The distance measured from the mid-point of the armpit, along the side of the body, to the waist level.	length	NBS 5.5.f ASTM B.44
58.1	Armseye-to-waist-right			MD 2.17
58.2	Armseye-to-waist-left			MD 2.18
59.	BackShoulder-width	The horizontal distance measured along the back of the shoulder between the left and right shoulder points, with the subject's arms hanging naturally.	length	ISO 2.1.5 ASTM B.41 MD 2.34
60.	FrontBust-arc	The length measured the front portion of the bust girth.	length	NBS 5.3.a ASTM B.18

<u>ID</u>	<u>Name</u>	<u>Definition</u>	<u>Category</u>	<u>References</u>
61.	FrontWaist-arc	The length measured the front portion of the waist girth.	length	NBS 5.3.b ASTM B.19
62.	FrontHighHip-arc	The length measured the front portion of the high hip girth.	length	NBS 5.3.c ASTM B.20
63.	Hand-length	The distance measured between the tips of the middle finger and the first crease at the base of the right hand, with subject's lower arm in line with the open hand and fingers together and thumb extended.	length	ISO 2.1.17
64.	Foot-length	The horizontal distance measured between perpendiculars in contact with the end of the most prominent toe and the most prominent part of the heel, with the subject barefoot.	length	ISO 2.1.25
65.	BackHip-arc	The length measured the back portion of the hip girth.	length	NBS 5.3.d ASTM B.21
66.	Cervical-to-wrist	The distance measured from the 7th cervical vertebra, along the outside of the arm, over the elbow, to the far end of the prominent wrist bone, with subject's arm bent at right angle in a horizontal position.	length	ISO 2.2.23 NBS-m 6.4.9

<u>ID</u>	<u>Name</u>	<u>Definition</u>	<u>Category</u>	<u>References</u>
67.	Cervical-to-waist	The distance measured from the 7th cervical vertebra, along the neck line, to the intersection of neck and shoulder, then to the center front at the waist level.	length	NBS 5.5.n ASTM B.38
68.	Cervical-bust-to-waist	The distance measured from the 7th cervical vertebra, around the base of the neck, to the bust point, then vertically to the waist level.	length	ISO 2.2.14
69.	Cervical-neck-to-bust	The distance measured from the 7th cervical vertebra, around the base of the neck, to the bust point.	length	ISO 2.2.13
70.	Cervical-to-knee	The distance measured from the 7th cervical vertebra, along the rear contour of the spinal column, to the level of the hips, then vertically to the knee level.	length	ISO 2.2.11
71.	Cervical-length	The distance measured from the 7th cervical vertebra, along the rear contour of the spinal column to the level of the hips, then vertically down to the ground.	length	ISO 2.2.12

<u>ID</u>	<u>Name</u>	<u>Definition</u>	<u>Category</u>	<u>References</u>
72.	Neck-to-waist	The distance measured from the intersection of shoulder and neck, along the body, to the bust point, then vertically to the waist level.	length	ISO 2.2.16
72.1	Neck-to-waist-right			MD 2.11
72.2	Neck-to-waist-left			MD 2.12
73.	OutsideLeg-length	The distance measured the outside of the leg from the waist, along the contour of the hip, then vertically down to the ground.	length	ISO 2.2.25
74.	FrontCrotch-length	The distance measured along the body from the center point of the front body at the waist level to the midway point of the crotch.	length	ASTM B.50 MD 2.25
75.	HighHip-seated-arc	The length measured the front portion of the high hip girth with the subject sitting erect on the table.	length	ASTM B.56
76.	BackCrotch-length	The distance measured from the center point of the back body at the waist level to the midway point of the crotch.	length	ASTM B.51
77.	FrontCrotch-depth	The depth distance measured at the midway point of the crotch using an L-square with right angle against the abdomen and up against the crotch.	length	ASTM B.52

<u>ID</u>	<u>Name</u>	<u>Definition</u>	<u>Category</u>	<u>References</u>
78.	FrontTrunk-length	The distance measured over the front of the body, from the midway point of the right shoulder to the midway point of the crotch.	length	ASTM B.22
79.	BackTrunk-length	The distance measured over the back of the body, from the midway point of the right shoulder to the midway point of the crotch.	length	ASTM B.23
80.	Waist-seated-arc	The length measured along the front portion of the waist girth with the subject sitting erect on the table.	length	ASTM B.55
81.	Armscopye-depth	The vertical distance measured from the shoulder point to the level of the lower armscopye.	length	ASTM B.42
82.	MidShoulder-to-waist	The distance measured along the body from the midway point of the shoulder, over the fullest part of the back shoulder blade, down to the waist.	length	
82.1	MidShoulder-to-waist-right			MD 2.28
82.2	MidShoulder-to-waist-left			MD 2.29
83.	FrontShoulder-width	The distance between the left and right shoulder points measured along the front of the shoulder with the subject's arms hanging naturally.	length	MD 2.23

<u>ID</u>	<u>Name</u>	<u>Definition</u>	<u>Category</u>	<u>References</u>
84.	InsideLeg-to-ankle	The distance measured from the midway point of the crotch, along the inside of the leg, to the ankle.	length	
84.1	InsideLeg-to-ankle-right			MD 2.21
84.2	InsideLeg-to-ankle-left			MD 2.22
85.	FrontChest-width	The distance measured across the front chest from the right side of body to the left side of the body, approximately at the level one-half inch below the underarm.	length	MD 2.24
86.	Elbow-to-wrist	The distance measured from the elbow, along the outside of the arm, to the far end of the prominent wrist bone, with subject's arms hanging naturally.	length	
86.1	Elbow-to-wrist-right			MD 2.15
86.2	Elbow-to-wrist-left			MD 2.16
87.	MidShoulder-to-bust	The distance measured from the midway point of the shoulder to the bust point.	length	
87.1	MidShoulder-to-bust-right			MD 2.2
87.2	MidShoulder-to-bust-left			MD 2.4

<u>ID</u>	<u>Name</u>	<u>Definition</u>	<u>Category</u>	<u>References</u>
88.	Armscye-to-ftWaist	The distance measured from the shoulder point to the center front at the waist level.	length	
88.1	Armscye-to-ftWaist-right			MD 2.9
88.2	Armscye-to-ftWaist-left			MD 2.10
89.	Armscye-to-bkWaist	The distance measured along the back from the shoulder point to the center back point of the waist.	length	
	Armscye-to-bkWaist-right			MD 2.30
	Armscye-to-bkWaist-left			MD 2.31
90.	Shoulder-slope	The value, in degrees, measured the slope of the shoulder with respect to the horizontal.	angle	NBS 5.5.i ISO 2.3.1 ASTM B.53 NBS-m 6.4.8
91.	Weight	The value, in kilograms, measured the mass of the subject.	weight	NBS 5.1 ISO 2.3.2 ASTM B.58



